The Saudi Dental Journal (2013) **25**, 83–89

King Saud University

The Saudi Dental Journal

www.ksu.edu.sa
www.sciencedirect.com

CASE REPORT

Minimally invasive use of coloured composite resin in aesthetic restoration of periodontially involved teeth: Case report

M.A. Wahbi [a,*], H.S. Al Sharief [b], H. Tayeb [b], A. Bokhari [b]

[a] *Conservative Dentistry, Makkah Dental Centre, P.O. Box 3381, Makkah, Saudi Arabia*
[b] *Makkah Dental Centre, P.O. Box 6152, Makkah 21955, Saudi Arabia*

Received 1 July 2012; revised 5 January 2013; accepted 5 February 2013
Available online 14 March 2013

KEYWORDS

Minimally invasive aesthetics coloured composite resin;
Pink and white composite resin veneers;
Open gingival embrasure;
Gingival coloured composite resin

Abstract Gingival recession causes not only aesthetic problems, but problems with oral hygiene, plaque accumulation, speech, and tooth sensitivity. Replacing the missing gingival tissue with composite resin, when indicated, can be a time- and cost-effective solution. Here we report the case of a 25-year-old female who presented with generalized gingival recession. Black triangles were present between the maxillary and mandibular anterior teeth due to loss of interdental tissues, caused by recent periodontal surgery. She also had slightly malposed maxillary anterior teeth. The patient elected to replace gingival tissue with pink composite resin and to alter the midline with composite resin veneers. The first treatment phase involved placement of pink gingival composite to restore the appearance of interdental papilla to her upper (16, 15, 14, 13, 12, 11, 21, 22, 23, and 24) and lower (34, 33, 32, 31, 41, 42, 43, and 44) teeth. Phase two was to place direct composite resin bonded veneers on her upper (16, 15, 14, 13, 12, 11, 21, 22, 23, and 24) teeth to alter the midline and achieve desired colour. The third treatment phase was to level the lower incisal edge shape by enameloplasty (31, 32, 41, and 42) to produce a more youthful and attractive smile. This case report and brief review attempt to describe the clinical obstacles and the current treatment options along with a suggested protocol. Use of contemporary materials such as gingival coloured composite to restore lost gingival tissue and improve aesthetics can be a simple and cost-effective way to manage patients affected by generalized aggressive periodontitis (AgP).

* Corresponding author. Tel./fax: +966 2 5270440.
E-mail address: mwahbi3000@yahoo.co.uk (M.A. Wahbi).

Peer review under responsibility of King Saud University.

ELSEVIER Production and hosting by Elsevier

1013-9052 © 2013 Production and hosting by Elsevier B.V. on behalf of King Saud University.
http://dx.doi.org/10.1016/j.sdentj.2013.02.001

1. Introduction

Aesthetic dentistry involves harmonious integration of smile design, conception, and material selection. This is accomplished by a comprehensive knowledge of facial aesthetics, tooth morphology, available restoration techniques, and communication skills. An understanding of smile components, teeth, gingival tissues, and lips, is crucial. The maxillary central incisors are the visual focal point for the smile, and they should be dominant and symmetrical. The ideal gingival levels are determined by establishing the correct width-to-length ratio of the maxillary anterior teeth (Marus, 2006; Wolfart et al., 2005). Generally, gingival tissue runs parallel to the upper lip and its architecture is bilaterally symmetrical. The zenith of this tissue on the maxillary central incisors and canines is skewed slightly to the distal side (Feigenbaum, 1991; Magne and Belser, 2004). The soft tissue height of the maxillary lateral incisors is approximately 1–2 mm incisal in comparison to the tissue height of the maxillary centrals and canines when a line is drawn from central incisors to canine tissue zeniths. The gingival embrasures should be bilaterally symmetrical and allow for interdental papillary architecture (Feigenbaum, 1991; Magne and Belser, 2004).

Aggressive periodontitis (AgP) includes both localized and generalized forms of periodontitis in which there is rapid destruction of the periodontal ligament and the alveolar bone in younger and otherwise systemically healthy individuals (Roshna and Nandakumar, 2012). Untreated AgP can result in flaring, protrusion, diastema, extrusion, rotation, and drifting of the teeth. Malocclusion caused by pathologic migration of teeth can be corrected by orthodontics once AgP has been stabilized with periodontal therapy (Roshna and Nandakumar, 2012).

Regeneration of the periodontal supporting structures lost due to periodontal disease and restoration of aesthetic appearance and function of the periodontium is difficult and in most cases requires interdisciplinary approaches (Maeda et al., 2005; Coachman et al., 2010; Roshna and Nandakumar, 2012). Techniques for periodontal regeneration include the use of grafts, barrier membranes or guided tissue regeneration, biologic modifiers like growth and differentiation factors, and extracellular matrix proteins such as enamel matrix proteins, or any combination of the above (Roshna and Nandakumar, 2012).

Gingival recession with the loss of the interdental papilla (also known as open gingival embrasures or ''black triangles'') causes a notable defect in the patient's smile when it affects the anterior teeth. This gingival defect also contributes to retention of food debris, adversely affecting the health of the periodontium (Kurth and Kokich, 2001; Donovan, 2009; Roshna and Nandakumar, 2012). Treatments include surgical or prosthetic approaches. Surgical treatment can be successful in creating aesthetically pleasing and anatomically correct tissue contours when small volumes of tissue are being reconstructed. However, long term results are variable due to the complexity of the interdental space and its vascularity (Babu et al., 2011). Surgical costs, healing time, discomfort, and varying long term results make this choice unpopular (Barzilay and Irene, 2003; Clark, 2008; Jacobson and Frank, 2008; Patil et al., 2011).

Prosthetic approaches to reproduction of artificial gingival tissue include porcelain, acrylics (denture base material), silicone based soft materials, or co-polyamide and composite resin. Each material has advantages, disadvantages, and specific indications (Barzilay and Irene, 2003; Capa, 2007; Coachman and Calamita, 2010). A removable prosthesis allows a larger volume of tissue to be replaced without disturbing other dental units and proper cleaning is still feasible (Barzilay and Irene, 2003; Patil et al., 2011). For patients requesting fixed restoration of soft tissue in the aesthetic zone, the use of gingiva-coloured (pink) porcelain can help in recreating natural tooth proportions and provide realistic alternatives to surgery (Sarver, 2004; Martegani et al., 2007; Alani et al., 2011; Malcmacher, 2005). The use of pink composite resin as an artificial gingival tissue was first described by Zalkind and Hochman (1997) in the management of a cervical defect. When used for soft tissue restoration, the cervical contour must be created such that plaque retention is prevented. This can be achieved using appropriate application instruments, adequate moisture control, and curing. For optimal aesthetics, a pseudo gingival sulcus can be created around the margin of the restoration that coincides with the previous free gingival margin. An advantage of using composite resin over pink porcelain is direct placement.

For proper tooth alignment, a clinician should present only treatment options that involve predictable, conservative restorations that preserve healthy tooth structure (Jacobson and Frank, 2008). Orthodontic alignment is expensive and time consuming, but usually successful. Minor alignment discrepancies take a few months to correct orthodontically, whereas moderate-to-severe alignment problems could take 6–12 months or more to resolve (Jacobson and Frank, 2008). The appearance of tooth alignment can be achieved using porcelain veneer restoration (PVR), but this procedure usually requires aggressive removal of tooth structure (Christensen, 2004; Christensen, 2006; Croll, 2003; Heymann and Kokich, 2002; Spear, 2004; Jacobson and Frank, 2008) and therefore is not a conservative measure. More conservative treatment options such as orthodontics, direct bonding composite resin, and enameloplasty should be offered to the patient. Moreover, the inability to restoratively improve gingival relationships with PVRs may result in achieving less-than-optimal aesthetics.

For patients with aesthetic and functional defects from loss of gingival tissue, composite resin material can be a timely and cost-effective alternative to surgical options.

2. Case report

This study was approved by *the Hospitals Human Ethics Committee*. Written informed consent was obtained from the patient for publication of this case report and accompanying images. The authors report no conflicts of interest in the preparation of this case report.

A 25-year-old female patient reported to the Department of Conservative Dentistry, Makkah Dental Center, Makkah, Saudi Arabia with a chief complaint of generalized gingival recession with black triangles present between the maxillary and mandibular anterior teeth (Figs. 1 and 2) caused by generalized aggressive periodontitis (GAgP). Once the disease was stabilized, the patient was closely monitored for 7 months prior to starting restorative therapy. After restoration, the patient was observed every 2 months for 18 months.

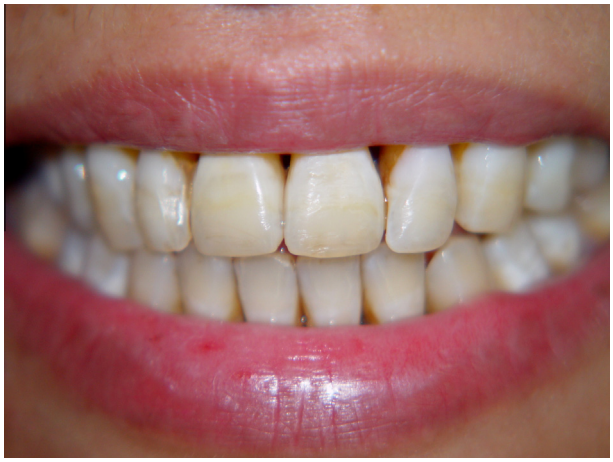

Figure 1 Facial view of patient's smile prior to restoration.

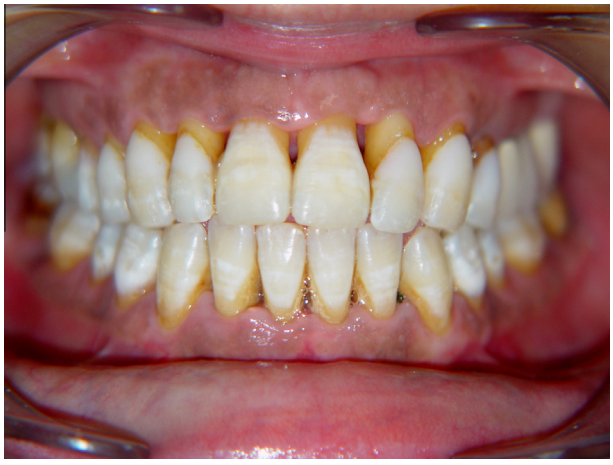

Figure 2 Facial view of the patient showing open gingival embrasure between the maxillary and mandible central incisors.

The patient complained of tooth sensitivity and oral hygiene problems resulting in plaque accumulation on maxillary and mandibular teeth. Air and fluid escaping from between the anterior teeth made her extremely uncomfortable. The patient was also very unhappy with the aesthetic appearance of "elongated teeth." The midline was canted considerably to the right and variations in the level of the incisal edge of the maxillary anterior incisors (12, 11, 21, and 22) caused a reverse smile and lack of central dominance (Fig. 2). The mandibular lateral incisors (32, 42) were rotated and slightly extruded, partially overlapping the central incisor, which impart softness and youthfulness to smile. Gingival recession with loss of the interdental papilla involved her maxillary (16, 15, 14, 13, 12, 11, 21, 22, 23, and 24) and mandibular (34, 33, 32, 31, 41, 42, 43, and 44) teeth (Figs. 1 and 2). The patient also had varying shades of mild brown band discolourations of the anterior teeth (11, 12, 13, 21, 22, and 23).

The patient was thoroughly informed about the different options for restoration of gingival tissue, alteration of the midline for aesthetic smile symmetry, and improved tooth shading. She expressed opposition to an additional surgical procedure to reconstruct open gingival embrasures by grafting and bone augmentation. Instead she opted for restoration of the dentogingival complex using the pink composite resin because this technique allowed satisfactory function and aesthetics at lower cost and could be completed chairside. She also chose to alter the midline and to block out the underlying tooth colour using composite resin.

3. Procedure

3.1. Restoration of the gingiva using pink composite resin

The teeth were isolated and acid etched with 35.0% phosphoric acid (3M ESPE Dental Products USA) for 15 s. Teeth were blotted dry and dental adhesive bonding agent (Adper Single Bond2 3M ESPE Dental Products USA) was applied and light cured according to manufacturers' instructions. The pink gingival composite (anaxGUM Pink Composite, Anaxdent, Stuttgart, Germany) was scalloped between the teeth and natural gingiva without preparation. The gingival base was made in layers to create the proper contours without any overhang of material. The material was light cured for 40 s using a light-emitting diode (LED) curing unit (Blue Phase C5, Ivoclar Vivadent, Amherst, NY). Composite was completed on the maxillary teeth (16, 15, 14, 13, 12, 11, 21, 22, 23, and 24) (Fig. 3) before placement on the mandibular teeth (34, 33, 32, 31, 41, 42, 43, and 44) (Fig. 4). Final contouring was performed using a composite finishing and polishing system (Enhance Dentsply Caulk Dentsply International Inc. Milford).

After soft tissue restoration with aesthetic gingival papillary levels and scalloping over the central incisors, composite splints were placed palatally from canine to canine to stabilize the teeth and reduce mobility. After two months, both patient and clinician were satisfied with the shade and contour of the pink gingival composite, and the composite splints were nicked off the tooth structure.

Alteration of the midline and shading of maxillary anterior teeth using composite resin veneers. Composite resin veneers were placed on maxillary teeth (16, 15, 14, 13, 11, 12, 21, 22, 23, and 24). Minimally invasive preparation techniques were used, with gross labial reduction from 0.3 to 0.5 mm. The gingival margin consisted of a shallow chamfer about 0.3 mm in

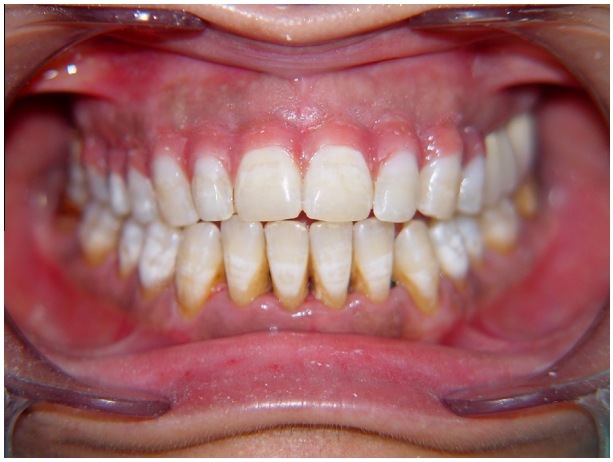

Figure 3 The maxillary pink gingival composite completed first around teeth ## (16, 15, 14, 13, 12, 11, 21, 22, 23, and 24).

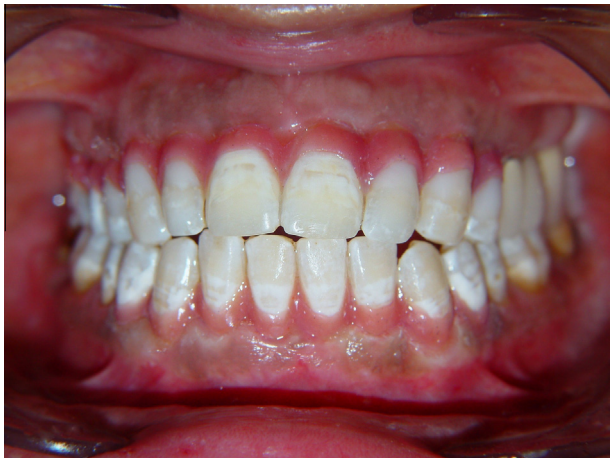

Figure 4 Facial view of the completed direct pink gingival composite around maxillary teeth ## (16, 15, 14, 13, 12,11, 21, 22, 23, and 24) and mandibular teeth ## (34, 33, 32, 31, 41, 42, 43, and 44).

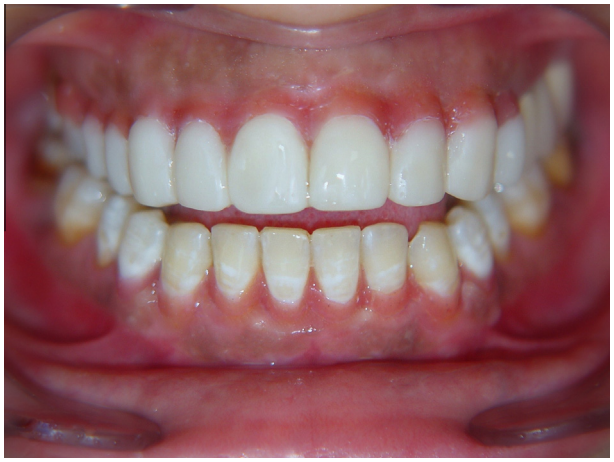

Figure 5 Facial view of the completed direct composite resin veneers for maxillary teeth ## (16, 15, 14, 13, 12, 11, 21, 22, 23, and 24) before finishing and polishing. Altering the incisal shape and leveling mandibular (32, 31, 41, and 42) anterior incisal edge by enameloplasty.

depth, placed using a 6844-016 round-end two-grit tapered diamond (Brasseler USA; Savannah, GA). The preparations extended sufficiently interproximally to conceal the margins. The incisal preparation was very minimal.

The prepared surfaces were acid etched with 35.0% phosphoric acid (3M ESPE Dental Products USA) for 15 s. Teeth were blotted dry and dental adhesive bonding agent (Adper Single Bond2 3M ESPE Dental Products USA) was applied and light cured according to manufacturer's instructions. The composite resin veneer was placed using an incremental layering technique to create a polychromatic effect. For this patient, shades A2B, A2E, and YT (Filtek Supreme Ultra, 3M ESPE, St. Paul, MN, USA) were placed along the labial enamel to mimic natural teeth. The composite material was sculpted by free-hand layering using a Greenstein Colour composite instrument (Safident; Gland, Switzerland) and each layer was cured for 10 s. Because of the minimal preparation design and mild tooth discolouration, no dentin shade (A2D) was necessary. Placement of each layer was closely monitored from the incisal view to prevent over bulking, which would negatively impact the health of the soft tissue. Cervically the composite veneer finished at the gingival pink composite, while the veneer blended incisally. The material was light cured for 40 s using the LED curing unit. Finally, the mandibular incisal edge shape was altered by enameloplasty (31, 32, 41, and 42), producing a more youthful and aesthetically pleasing smile (Fig. 5). However, Fig. 6 shows harmonious aesthetic expectations for the patient. While Figs. 7 and 8 show pre- and post-operative aesthetic anticipation of the patient's restorations in the new smile design that is satisfactory at 18 months post restoration (Fig. 9).

Figure 6 The definitive restorations exhibited a harmonious, natural form and achieved the aesthetic expectations of the patient.

4. Discussion

The emerging field of "cosmetic periodontics" has come about through collaboration between dentists, orthodontists, and periodontists. Features that define a desirable smile have been refined while retaining consideration and respect for individual variations (Tanaka et al., 2008). Challenging cases involving the anterior area require a more comprehensive approach and a deeper understanding of the pink component of the smile, the gingiva. The gingival architecture represents the frame for the teeth. If it is not restored correctly, either surgically or prosthetically, it will impair the final three dimensional aesthetic (Zalkind and Hochman, 1997; McCoy et al., 1998; Coachman and Calamita, 2010).

Patients with advanced periodontitis are at high risk for gingival recession and open gingival embrasures ("black triangles"). Surgical treatment for the aesthetic and functional problems caused by open gingival embrasures are often insufficient to re-establish ideal aesthetics. Prosthetic gingival restoration with gingival coloured "pink" composite resin materials can overcome the limitations of grafting (Coachman et al., 2009) and can be a good alternative for reconstructing tissue lost due to ridge deformities (Coachman et al., 2010).

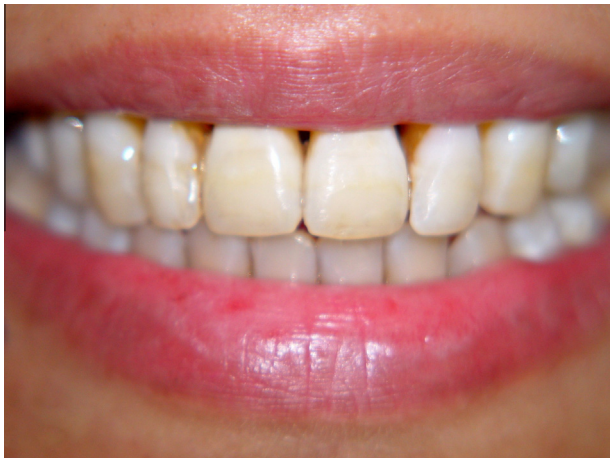

Figure 7 Pre and postoperative aesthetic appearance of the completed direct resin veneers. Note the harmony of the patient's restorations in the new smile design.

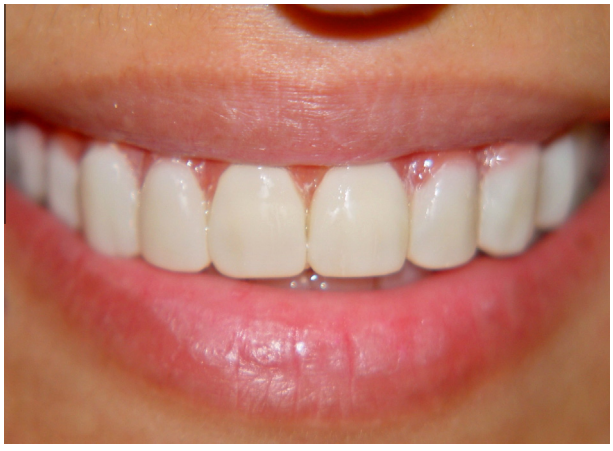

Figure 8 Pre and postoperative aesthetic appearance of the completed direct resin veneers. Note the harmony of the patient's restorations in the new smile design.

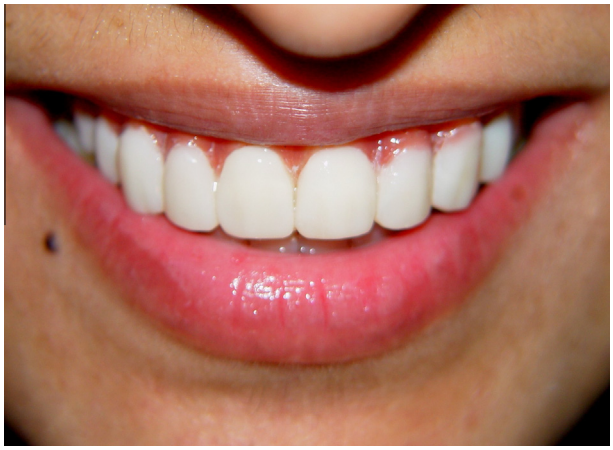

Figure 9 Patient's smile at 18 months post restoration showing satisfactory function and aesthetics.

Therefore, composite resin should be a consideration in the initial treatment plan.

When using composite resin for gingival restoration, the buccal and palatal/lingual aspect of the restoration should provide comfort during mastication, ensure optimum phonetics, avoid food entrapment, and promote air sealing between the patient's natural gingiva and the prosthetic gingiva (Coachman and Calamita, 2010). The application must be carefully assessed to prevent undue thickness which could cause plaque retention, compression of the papilla, and inflammation, leading to subsequent aesthetic problems (Burke et al., 1994; Tanaka et al., 2008). The greatest challenge in using restorations to alter interproximal embrasure form is for the clinician to carry the restoration subgingivally to gradualize the contour change. Attempting to leave the margin at gingival levels will leave ledges of restorative material and will negatively impact the papillary form (Spear, 2007).

In the case presented here, the patient had gingival and ridge recession leading to open embrasures that caused functional and aesthetic problems (Figs. 1 and 2). A major consideration in alveolar ridge recession is the vertical aspect of the defect, including papillae and gingival margin levels. The use of pink composite resin was indicated in this case to restore the gingival architecture and to guide the shape of the interdental papilla (Figs. 4 and 5) and was a time- and cost-efficient alternative to surgery. After gingival restoration, the patient's maxillary teeth were splinted to prevent mobility and improve prognosis, as suggested (Strassler, 2009).

Problems with midline and tooth discolouration can both be improved with veneers. Newer dental adhesive materials do not require as much mechanical retention, allowing minimally invasive preparations and conservation of tooth structure (Murdoch-Kinch and McLean, 2003). Most manufacturers of dental adhesives offer both a total-etch adhesive and a self-etch adhesive. Research shows the highest mean bond strengths to enamel were obtained with total-etch adhesives (Bagis et al., 2008; Strassler and Sensi 2008). New resin materials and better adhesive bonding allow minimally invasive preparation, yet still allow predictable bond strength and longevity. These features satisfy numerous clinical indications with immediate results for even the most cosmetically discerning patients (Terry, 2004; Koczarski and Fligor 2005). Conservation of healthy tooth structure is especially important in patients who have only cosmetic concerns (Heymann and Swift, 2001; Christensen, 2006; and Radz, 2008).

The use of composite veneers can be a cost- and time-saving alternative to porcelain when indicated (Fahl, 2007; Dietschi and Devigus, 2011). Long term (5 year) satisfaction with composite veneers has been reported (Zorba et al., 2010). In addition, both pink and white composite materials have been shown to have similar bond strength (An et al., 2011) For the patient presented here, tooth preparation was minimal, conserving natural tooth structure while providing maximum enamel substrate for a stronger bond. A total-etch adhesive was used instead of a self-etch to obtain better bonding to enamel. The composite resin veneer application achieved a more aesthetic midline placement and easily blocked out the underlying mild tooth discolouration. Following this and any other restoration, proper hygiene and maintenance procedures should be carefully discussed with the patient, as they are paramount for the long-term success of the restoration (Coachman and Calamita, 2010).

This paper describes a clinical situation in which gingivally coloured composite was effectively used to restore missing gingival tissue, solving aesthetic and functional problems. All procedures were minimally invasive and cost effective. The goal of both patient and clinician is to create a comfortable, healthy, and cleansable restoration while maintaining a high aesthetic level. At 18 months post restoration, the patient reports no problems (Fig. 9).

5. Conclusions

We report 18 months post restoration patient's and clinician's satisfaction with aesthetics and function of gingival and midline rehabilitation by application of pink and white direct composite material using minimally invasive procedures. Use of pink composite for restoration of the gingiva allows immediate results at a relatively low cost without potential surgical postoperative recovery complications. With this method, large tissue volumes are easily replaced by artificial materials. Composite resin veneers were also successfully placed to alter midline and achieve better tooth colour.

References

Alani, A., Maglad, A., Nohl, F., 2011. The prosthetic management of gingival aesthetics. Br. Dent. J. 210 (2), 63–69.

An, H.S., Park, J.M., EJ, P., 2011. Evaluation of shear bond strengths of gingiva-colored composite resin to porcelain* metal and zirconia substrates. J. Adv. Prosthodont. 3 (3), 166–171.

Babu, K.B., Madhu Babu, D.S., Dodani, K., Sekhar, Leela, Reddy, N.R., 2011. Reconstruction of the interdental papillae using an interdisciplinary approach following orthodontic treatment: a case report. Int. J. Contemp. Dent. 2 (2).

Bagis, B., Aydoðan, E., Bagis, Y.H., 2008. Direct restorative treatment of missing maxillary laterals with composite laminate veneer: a case report. Open Dent. J. 2, 93–95.

Barzilay, I., Irene, T., 2003. Gingival prostheses—a review. J. Can. Dent. Assoc. 69 (2), 74–78.

Burke, S., Burch, J.G., Tetz, J.A., 1994. Incidence and size of pretreatment overlap and posttreatment gingival embrasure space between maxillary central incisors. Am. J. Orthod. Dentofacial Orthop. 105, 511.

Capa, N., 2007. An alternative treatment approach to gingival recession: gingiva-colored partial porcelain veneers: a clinical report. J. Prosthet. Dent. 98 (2), 82–84.

Christensen, G.J., 2004. What is a veneer? Resolving the confusion. J. Am. Dent. Assoc. 135 (11), 1574–1576.

Christensen, G.J., 2006. Veneer mania. J. Am. Dent. Assoc. 137, 1161–1163.

Clark, D., 2008. Restoratively driven papilla regeneration: correcting the dreaded 'black triangle'. Tex. Dent. J. 125 (11), 1112–1115.

Coachman, C., Calamita, M., 2010. The reconstruction of pink and white esthetics. Inter. Dent. SA 12 (3), 88–93.

Coachman, C., Salama, M., Garber, D., Calamita, M., Salama, H., 2009. Prosthetic gingival reconstruction in a fixed partial restoration. Part 1: introduction to artificial gingiva as an alternative therapy. Int. J. Periodontics Restor. Dent. 29, 471–477.

Coachman, C., Van Dooren, E., Gurel, G., Calamita, M., Calgaro, M., de Souza Neto, J., 2010. Minimally invasive reconstruction in implant therapy: the prosthetic gingival restoration. QDT 33, 61–75.

Croll, T.P., 2003. Dentistry ... we have a problem. J. Esthet. Restor. Dent. 15 (4), 201–202.

Dietschi, D., Devigus, A., 2011. Prefabricated composite veneers: historical perspectives, indications and clinical application. Eur. J. Esthet. Dent. 6, 178–187.

Donovan, T.E., 2009. Clinical management of root caries. J. Indiana Dent. Assoc. 88 (1), 23–24.

Fahl, N.J., 2007. A polychromatic composite layering approach for solving a complex class IV/direct veneer/diastema combination: part II. Pract. Proced. Aesthet. Dent. 19, 17–22.

Feigenbaum, N.L., 1991. Aspects of aesthetic smile design. Pract. Periodontics Aesthet. Dent. 3 (3), 9–13.

Heymann, H.O., Kokich, V.G., 2002. Instant orthodontics: viable treatment option or "quick fix" cop-out? J. Esthet. Restor. Dent. 14 (5), 263–264.

Heymann, H.O., Swift Jr., E.J., 2001. Is tooth structure not sacred anymore? J. Esthet. Restor. Dent. 13 (5), 283.

Jacobson, N., Frank, C.A., 2008. The myth of instant orthodontics: an ethical quandary. J. Am. Dent. Assoc. 139 (4), 424–434.

Koczarski, M.J., Fligor, 2005. Posterior aesthetics using a single-shaded composite resin: a case presentation. Pract. Proced. Aesthet. Dent. 17 (2), 145–148.

Kurth, J.R., Kokich, V.G., 2001. Open gingival embrasures after orthodontic treatment in adults: prevalence and etiology. Am. J. Orthod. Dentofacial Orthop. 120 (2), 116–123.

Maeda, S., Maeda, Y., Ono, Y., Nakamura, K., Sasaki, T., 2005. Interdisciplinary treatment of a patient with severe pathologic tooth migration caused by localized aggressive periodontitis. Am. J. Orthod. Dentofacial Orthop. 127 (3), 374–384.

Magne, P., Belser, U.C., 2004. Novel porcelain laminate preparation approach driven by a diagnostic mock-up. J. Esthet. Restor. Dent. 16 (1), 7–16 [discussion 17–8].

Malcmacher, L., 2005. No-preparation porcelain veneers–back to the future! Dent. Today 24 (3), 86, 88, 90–1.

Martegani, P., Silvestri, M., Mascarello, F., Scipioni, T., Ghezzi, C., Rota, C., et al, 2007. Morphometric study of the interproximal unit in the esthetic region to correlate anatomic variables affecting the aspect of soft tissue embrasure space. J. Periodontol. 78 (12), 2260–2265.

Marus, R., 2006. Treatment planning and smile design using composite resin. Pract. Proced. Aesthet. Dent. 18 (4), 235–241.

McCoy, R.B., Anderson, M.H., Lepe, X., Johnson, G.H., 1998. Clinical success of class V composite resin restorations without mechanical retention. J. Am. Dent. Assoc. 129 (5), 593–599.

Murdoch-Kinch, C.A., McLean, 2003. Minimally invasive dentistry. J. Am. Dent. Assoc. 134, 87–95.

Patil, S., Prabhu, V., Danane, N.R., 2011. Gingival veneer: mask the unesthetic. J. Indian Soc. Periodontol. 15 (3), 284–287.

Radz, G., 2008. Elective veneers: meeting patients' expectations while addressing current ethical questions of elective care. Inside Dent. 4 (3), 48–52.

Roshna, T., Nandakumar, K., 2012. Generalized aggressive periodontitis and its treatment options: case reports and review of the literature. Case reports in medicine 10.1155//535321, 1–17.

Sarver, D.M., 2004. Principles of cosmetic dentistry in orthodontics: part 1. Shape and proportionality of anterior teeth. Am. J. Orthod. Dentofacial Orthop. 126, 749–753.

Spear, F.M., 2004. The esthetic correction of anterior dental malalignment conventional vs. instant (restorative) orthodontics. J. Calif. Dent. Assoc. 32 (2), 133–141.

Spear, F.M., 2007. Interdisciplinary esthetic management of anterior gingival embrasures. Inside Dent. 3 (3).

Strassler, H.E., 2009. Tooth stabilization improves periodontal prognosis: a case report. Dent. Today 28 (9), 88–93.

Strassler, H., Sensi, 2008. Applications of etch-and-rinse adhesive bonding for esthetic restorative dentistry. Funct. Esthet. Restor. Dent. 2 (1), 26–33.

Tanaka, O.M., Furquim, B.D.'.A., Pascotto, R.C., Ribeiro, G.L.U., Bósio, J.A., Maruo, H., 2008. The dilemma of the open gingival embrasure between maxillary central incisors. J. Contemp. Dent. Pract. 6 (9), 092–98.

Terry, D.A., 2004. Restoring the dento-gingival complex, Part 2. Dent. Today 23 (6), 96–100.

Wolfart, S., Thormann, H., Freitag, S., Kern, M., 2005. Assessment of dental appearance following changes in incisor proportions. Eur. J. Oral Sci. 113 (2), 159–165.

Zalkind, M., Hochman, N., 1997. Alternative method of conservative esthetic treatment for gingival recession. J. Prosthet. Dent. 77 (6), 561–563.

Zorba, Y.O., Bayindir, Y.Z., Barutcugil, C., 2010. Cagatay barutcugil. Direct laminate veneers with resin composites: two case reports with five-year follow-ups. J. Contemp. Dent. Pract. 11 (4), 1–7.